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Plaster for Preventing Body Odor
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Specification /1*

1. Title of the Invention

Plaster for Preventing Body Odor

2. Claim

1. A plaster which prevents body odor provided with a base material and an adhesive layer on at least one side of said base material, the invention characterized such that said base material is made up of a non-woven cloth or woven cloth having stretchability;

said adhesive layer contains cyclodextrin and/or a derivative thereof.

2. A plaster which prevents body odor as described in Claim 1, wherein the abovementioned cyclodextrin and/or derivative thereof is contained on the abovementioned adhesive layer at a percentage of at least 3 wt %.

3. A plaster used to prevent body odor as described in Claim 1, wherein a stretchable film is laminated onto the surface of the abovementioned base material which is opposite the abovementioned adhesive layer.

4. A plaster used to prevent body odor as described in Claim 1, wherein the abovementioned base material and the abovementioned adhesive layer are laminated via a stretchable film.

3. Detailed Description of the Invention

(Industrial Field)

* Numbers in the margin indicate pagination in the foreign text.

The present invention relates to a plaster which prevents body odor which can be easily applied to the human body and which can prevent body odor particularly underarm odor on a sustained basis.

(Prior Art)

Methods of removing foul odors coming from one part of the human body involves bathing, and cleaning and wiping as well as masking and neutralizing the foul odor using a fragrance and the like. Masking involves adding an odor to the odor to be eliminated which is sensed relatively quickly by the user and ensures that the foul odor does not stand out. Neutralizing foul odors involves adding another type of odor to a foul odor and weakening its inherent odor. For example, vanilla, jasmine and musk are used as this fragrance. However, methods of eliminating these foul odors do not drastically remove the source of the odor and once a prescribed period of time has passed, the odor again appears. Although there is a method wherein the odorous substance is reacted with a certain substance or it is changed into another substance with a weak odor, the foul odor is not eliminated for long periods of time even when this method is used. Foul odors particularly underarm odors which cause discomfort to /2 other persons must be eliminated on a sustained basis (8 to 10 hours or more).

(Problems Which the Present Invention is Intended to Solve)

It is an object of the present invention to solve the abovementioned problems associated with the conventional technique

and to provide a plaster which prevents body odor and systematically eliminates body odor. It is another object of the present invention to provide a plaster which prevents body odor which stretches when the skin stretches. It is still another object of the present invention to provide a plaster that prevents body odor that can be simply applied. It is yet another object of the present invention to provide a plaster that prevents body odor that does not cause a moist feeling.

(Means Used to Solve the Problems)

The present invention was attained based on findings made by the inventor indicating that body odor can be continuously removed for long periods of time by incorporating the malodorous constituents of body odor into cyclodextrin instead of using the conventional body odor removing method which involved masking and neutralizing the foul odor using a fragrance and the like. Masking involves adding an odor to the foul odor to be removed which can be sensed relatively quickly by the user's sense of smell, thereby ensuring that the foul odor does not stand out too much. Neutralizing foul odors involves adding another type of odor to the existing foul odor and weakening the inherent odor. Examples of this type of fragrance include vanilla, jasmine, musk and the like. However, these methods of removing the foul odor do not eradicate the source of the odor and once a prescribed period of time has passed, the foul odor again appears. While there are methods which involve reacting the foul smelling

substance with a certain type of substance and rendering it odorless or changing it to another substance which has a weaker odor, the foul odor is not removed over long periods of time even when this method is used.

The plaster that prevents body odor in the present invention is a plaster which has a base material as well as an adhesive layer on at least one side of said base material. Said base material is made up of non-woven cloth or woven cloth provided with stretchability; said adhesive layer contains cyclodextrin and/or a derivative thereof, thereby attaining the abovementioned objective.

Cyclodextrin and cyclodextrin derivatives are contained in the adhesive layer within a range of at least 3 wt % and preferably within a range of at least 5 wt %. When less than 3 wt % is contained, the body odor cannot be removed effectively. Cyclodextrin is usually contained within a range of 3 to 40 wt %. Although 40 wt % of it and above may be contained, the material is wasted and the adhesiveness of the adhesive layer declines. Cyclodextrin contains three types of dextrin: α-,β-, and γ-dextrin, depending on the glucose number which makes it up. The cyclodextrin used in the present invention may be any of the abovementioned compounds as well as mixtures of these. The mixture includes mixtures prior to isolation in each type of cyclodextrin in the cyclodextrin manufacturing process. The mixture ratio for this mixture is α :β : γ = approximately 6:3:1 (weight ratio). However, a mixture made by

mixing each type of cyclodextrin at any ratio may also be used. For example, it may be a compound wherein 1 or several maltose molecules are introduced to the cyclodextrin skeleton in a cyclodextrin derivative.

The base material is made up of a non-woven cloth or woven cloth which has stretchability. The stretchability of this base material is within the range of 30% and above and preferably within the range of 50% and above. When it has less than 30% stretchability, the plaster obtained no longer exhibits stretchability on the affected parts. The base material may be made of a well-known stretchable non-woven cloth or woven cloth so that the water content passes through the sweat on the skin and peeling caused by hot stuffiness, rash, rubor and pooling of water is prevented. The raw material for the base material may be a stretchable thread such as a stretchable processed thread made up of spandex thread, spandex core yarn, spandex covered yarn, rubber core yarn, synthetic fiber (nylon, polyester, acrylic and the like). The base material which uses these raw materials may be highly stretchable woven fabric, thread made so that it is stretchable (or regular thread), stockinette and other knitted cloth. Woven cloth made of spandex core yarn is especially suitable. Here, by "stretchability" is meant that it exhibits an "elongation percentage" (elastic elongation percentage) within a range wherein it can stretched elastically. By "range within it can stretch elastically" is meant the range wherein it can completely return to its original

length without applying an outside force to it. However, since the return time varies depending on the material used, stretchability as used in the present invention is defined using the following method.

We made a test piece which was 20 mm wide and at least 80 mm /3 long. We made two marker lines at a width of 50 mm in the center part of this test piece. We used 2 points having an interval of 80 mm between them as a fulcrum for the test piece. We stretched these respectively in the opposite direction at a speed of 30 cm/min. We stopped pulling it at a predetermined length and then returned the test piece to its original length at a speed of 30 cm/min. The test piece stopped at the point that it returned to the initial length and it we left it there for 10 minutes without applying any external force. After we set it aside, we measured the length of the markers on the test piece. We varied the stretching length, carried out tests repeatedly and found the longest stretching length wherein the elongation percentage of the markers was within 5%. We compared the maximum stretching length with the length of the test piece, measured the elongation percentage of the test piece and defined this as the stretchability of the material.

elongation percentage of marker line $= l_n - l_0 / l_0$

where l_0 : the length of the original marker lines (50 mm)
l_n : the length of the marker line after stretching operations
measuring temperature : 22 ± 2 °C
measuring humidity: 65 ± 5%

A regular pressure-sensitive adhesive was used for the adhesive contained in the adhesive layer. This pressure-sensitive adhesive had a composition such that it could be stuck on and peeled off a multiple number of times. The Tg of this composition was contained within a range of -110 °C to 10 °C. Suitable adhesives are as follows: (meth)acrylate ester (co)polymers, natural rubber or synthetic rubber (IR, IIR, SBR, SIS block copolymers, SBS block copolymers and mixtures of these) group compositions, polyvinyl ether group compositions, ethylene-vinyl acetate copolymers (EVA) group compositions, polyurethane group compositions, water-soluble polymer group compositions and the like. An adhesive manifestation agent (softening agent and the like) may be contained in these adhesives as needed. When a water-soluble polymer is added to this adhesive, sweat and other moisture are absorbed so that it can stick to the surface of moist skin. Water-soluble polymers include for example, guar gum, tragacanth gum, karaya gum, pectin, polyvinyl pyrrolidone, polyvinyl alcohol, sodium polyacrylate, sodium carboxymethyl cellulose, carboxymethylated starch and the like.

Besides the base material and the adhesive layer, a stretchable film may be laminated on the plaster used to prevent body odor in the present invention to restrict liquids from passing through without damaging the stretchability. This stretchable film may be laminated on the base material on the side opposite the adhesive layer. Furthermore, the base material and the adhesive layer may be

laminated via a stretchable film. Ethylene-vinyl acetate copolymers, polybutadiene, SIS, SBS, chlorinated polyethylene, plasticizing polyvinyl acetate, alkoxy alkyl (meth)acrylate (co) polymers and polyamides may be used as this stretchable film material.

The plaster used to prevent body odor in the present invention is produced as follows:

We dissolved the adhesive in a suitable solvent and used this as an adhesive solution. Solvents used include, for example, acetate esters, ketones, aliphatic hydrocarbons, alicyclic hydrocarbons or mixed solvents of these and alcohol. Cyclodextrin is added to this solution, it is mixed and it is then dispersed evenly. On the other hand, an adhesive may be heated and melted without using a solvent and cyclodextrin may be added while kneading it.

We coated the adhesive solution or the kneaded product onto the surface of the base material. Methods which can be used include coating the solution or the kneaded product directly onto the base material and letting it dry; the method which involves coating the solution or the kneaded product onto silicone or other peeling sheet, allowing it to dry and then crimping it on the base material (transfer coating method); and the like. The stretchable film is laminated as needed during coating.

This type of plaster used to prevent body odor is characteristic in that before using, a protective paper which can be peeled off or a film is usually laminated on the surface of the adhesive layer so

that the cyclodextrin does not include other foul smelling constituents in the air.

(Practical Examples of the Invention)

Next, we shall discuss practical examples of the present invention.

Practical Example 1

We dissolved 2-ethylhexyl acrylate, isobutyl methacrylate and methacrylic acid in ethyl acetate, carried out solution polymerization using the regular radical polymerization method using a lauroyl peroxide solvent (monomer ratio: 1.3 wt %) and prepared an ester methacrylate group copolymer having the following composition. /4

2-ethylhexyl acrylate	80 wt %
isobutyl methacrylate	17 wt %
methacrylate acid	3 wt %

The weight-average molecular weight of this ester acrylate group copolymer is 540000 and Tg [glass transition temperature] was -69 °C using the DSC [Differential Scanning Calorimetry] method. This copolymer was provided to the ethyl acetate as the adhesive solution having a concentration of 30 wt%.

We added 3 wt parts of a cyclodextrin mixture relative to 100 wt parts of this adhesive solution and stirred it for approximately 10 minutes using a "short-wing" type high-speed rotary stirrer and dispersed it uniformly in this cyclodextrin mixture. The mixing ratio of each type of cyclodextrin in this cyclodextrin mixture was α : β : γ (weight ratio).

(1) Preparation of Tacky Adhesive Solution

We used a cloth having the following configuration as a base material. This cloth had a stretchability of approximately 80% in the weft direction.

Warf (Suf "20S)	80/inch
Weft (Suf "20S Spandex core yarn)	40/inch

We carried out singeing processing beforehand on the surface of the base material which was to be coated. Next, we coated a polyisopren-methyl methacrylate graft copolymer (weight ratio of 7:3) onto this processing surface using the gravure coating method so that the layer was approximately 8 g/cm^2 thick and carried out anchoring processing. We coated the adhesive solution obtained in (1) above onto this layer which had been subjected to anchoring processing using the transfer coating method using silicone separating paper and formed an adhesive layer which was approximately 70 μm thick. We cut the plaster obtained so that it was 10 cm x 6 cm so that it was ready for use. The silicone separating paper is to be peeled off when the plaster is used.

(3) Evaluation of Plaster

We stuck the plaster obtained in (2) above under both arms of a person with underarm odor at 7 a.m. We raised the plaster up on the arm at an angle of approximately 140 °C and raised the plaster up and down in the lengthwise direction. The plaster was stuck on for approximately 36 hours and was peeled off on the following day at 7

a.m. While the plaster was stuck on, neither the person using the plaster nor the people around the user became aware of any bad odor coming from the underarm area. Furthermore, this plaster stretched as the skin stretched and it did not peel off. Approximately 4 hours after the plaster was stuck on, the user experienced slight discomfort; however, thus gradually disappeared as the person became used to it. There was no pain when the user raised his/her arm and the user did not feel any stuffiness due to the plaster. Virtually no rash, rubor or the like was confirmed after the plaster was peeled off. There was no pain when the plaster was peeled off and none of the adhesive remained on the skin.

(3) Evaluation of Plaster

We stuck the plaster obtained in (2) above under both arms of a person with underarm odor at 7 a.m. We raised the plaster up on the arm at an angle of approximately 140 °C and moved the plaster up and down in the lengthwise direction. The plaster was stuck on for approximately 36 hours and was peeled off on the following day at 7 a.m. While the plaster was stuck on, neither the person using the plaster nor the people around the user became aware of any bad odor coming from the underarm area. Furthermore, this plaster stretched as the skin stretched and it did not peel off. Approximately 4 hours after the plaster was stuck on, the user experienced slight discomfort; however, thus gradually disappeared as the person became used to it. There was no pain when the user raised his/her arm and

the user did not feel any stuffiness due to the plaster. Virtually no rash, rubor, or the like was confirmed after the plaster was peeled off. There was no pain when the plaster was peeled off and none of the adhesive remained on the skin.

Practical Example 2

(1) Preparation of Adhesive Solution

We mixed the abovementioned formulation:

Synthetic polyisopren rubber (IR, IR-2200; made by Nippon Synthetic Rubber Ltd.)	90 wt parts
Styrene-isopren-styrene block copolymer (SIS, E-2359; made by Sumitomo Chemical Ltd.)	10 wt parts
Poly-β-pinene resin (softening point of 110 °C)	70 wt parts
Squarane (softener)	25 wt parts
2,6-di (t-butyl)-p-cresol (antioxidant)	1 wt part
Glycyl recin	0.5 wt parts

and then dissolved it in cyclohexane and produced an 18% adhesive solution. We added the same cyclodextrin mixture as in Practical Example 1 to 100 wt parts of this adhesive solution at a ratio of 2.5 wt parts.

(2) Production and Evaluation of the Plaster

We used the same base material as in Practical Example 1. We coated the adhesive solution obtained in (1) above on top of this

base material using the same method as in Practical Example 1 and formed an adhesive layer which was approximately 80 μm thick. The plaster obtained was cut for example so that it was 10 cm x 6 so that it was ready for use. When we stuck this plaster onto the underarm area of a person having underarm odor just as we did in Practical Example 1, neither the person using the plaster nor the people in the vicinity of the user became aware of any underarm odor while the plaster was stuck on. Moreover, the plaster stretched as the skin stretched and it did not peel off. The user felt a slight discomfort approximately 4 hours after it was stuck on; however, this gradually disappeared as the person became used to it. However, there was no pain when the user raised his/her arm and there was no hot stuffy /5 feeling caused by the plaster. After the plaster was stuck on, no rash or rubor and the like was confirmed on the area where the plaster was stuck on.

Practical Example 3

(1) Preparation of Adhesive Solution

We mixed the following components:

Rubber polyvinyl isobutyl ether (Rutonal IC; made by BASF Ltd.) 75 wt parts

Sticky polyvinyl isobutyl ether (Rutonal I-30; made by BASF Ltd.) 25 wt parts

2,2'-methylene bis-(4-ethyl-6-t butyl phenol 1 wt part

(Tg of mixture was approximately -28 °C) and then dissolved it in ethyl acetate, thereby preparing an 18% adhesive solution. We added the same cyclodextrin mixture as in Practical Example 1 to 100 wt parts of this adhesive solution at a ratio of 5 wt parts.

(2) Production and Evaluation of Plaster

We used the same base material as in Practical Example 1. We coated the adhesive solution obtained in (1) above onto this base material using the same method as in Practical Example 1 and formed an adhesive layer which was approximately 50 μm thick. The plaster obtained was cut, for example, so that it was 10 cm x 6 cm and was ready for use. We stuck this plaster onto the underarm area of a person having underarm odor just as we did in Practical Example 1. The plaster was stuck on at 7 a.m. and was peeled off at 7 a.m. on the following day (total sticking time of 24 hours). Neither the person using the plaster nor any of the people around this person experienced any foul odor while the plaster was stuck on. Moreover, this plaster stretched as the skin stretched and it did not peel off. Approximately 4 hours after it had been stuck on, the user felt slight discomfort; however, this gradually went away as the user became used to the plaster. There was no pain caused when the arm was raised and lowered and there was no feeling of heat caused by the plaster. After the plaster was peeled off, no rash or rubor and the like was experienced on the site where the plaster was stuck. When

the plaster was peeled off, there was no pain and none of the adhesive remained on the skin.

Practical Example 4

(1) Preparation of Adhesive Solution

We mixed the following preparation:

polyvinyl pyrrolidone (Kollidon K-90; made by BASF) 18 wt parts

Sodium carboxymethyl cellulose (Celogen FSBH-12; made by Dai-ichi Kogyo Seiyaku Co. Ltd.) 3 wt parts

Bridging-type polyacrylic acid (Junron PW-150; made by Nippon Junyaku Co. Ltd 5 wt parts

Maltitol 74 wt parts

Ethyl paraben 0.1 wt parts

(the Tg of the mixture was approximately 4 °C). Then, we dissolved it in water and prepared a 15% adhesive solution. We added 5 weight parts of maltitose bonded cyclodextrin (Maltosyl CD; made by Taiyo Fishery Company Ltd.) and dissolved the cyclodextrin uniformly.

(2) Production and Evaluation of Plaster

We used a cloth made up of the following as a base material.

Warp (Polyester *20S) 50 threads/inch

Weft (Polyester *20S; spandex core yarn) 30 threads/inch

We laminated a polyether group polyurethane film (stretchable film) which was approximately 30 μm thick using a dry-bonding adhesive (approximately 10 g/cm^2) onto the base material. We coated the adhesive solution obtained in (1) above directly onto the surface

of the side opposite the stretchable film on this base material and formed an adhesive layer which was approximately 60 μm thick. The plaster obtained was highly hydrophilic and could be stuck onto skin which had been made moist by sweat and the like. Moreover, it did not readily peel off even when the user sweated or when it became wet. This plaster was cut so that it was, for example, 10 cm x 6 cm so that it was ready for use.

We stuck this plaster onto the underarm area of a person having underarm body odor just as we did in Practical Example 1. The plaster was stuck on at 7 a.m. and was peeled off at 10 a.m. the following day (total sticking time of 15 hours). Neither the person using the plaster nor the people around the user became aware of any unpleasant underarm odor while it was stuck on. Moreover, this plaster stretched as the skin stretched and it did not peel off. Approximately 3 hours after it had been stuck on, the user felt slight discomfort; however, it gradually went away as the user became used to it. There was no pain when the user raised and lowered his/her arm nor was there any warm stuffy feeling caused by the plaster. After the plaster had been peeled off, no rash or rubor and the like was confirmed at the site was the plaster had been stuck on. There was no pain when the plaster was peeled off nor did any of the adhesive remain on the skin.

(Effect of Invention)

Thus, the plaster used to prevent body odor in the present /6

invention contains cyclodextrin on the adhesive layer so that body odor, particularly underarm odor, is effectively prevented. When this is stuck onto the underarm area of the human body, the foul odor in the area is eliminated continuously. The underarm foul odor can be removed for 15 to 30 hours or for even longer. Furthermore, this plaster is made of a base material such as non-woven cloth or woven cloth which is stretchable. As a result, it stretches when the skin stretches and does not readily peel off. It has a configuration such that when a stretchable film is laminated on the base material, it has the effect of preventing liquid from directly permeating without adversely affecting the stretchability and of providing the appropriate body to the base material. No discomfort or pain is caused to the skin on which the plaster is stuck. The base material of the plaster lets moisture pass through so that the user does not feel hot or moist. This plaster is applied simply and it does not readily peel off when needed. As a result, the plaster in the present invention is effective in that it eliminates body odor, particularly underarm odor.